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Attentional focus during exposure in spider phobia: The role of schematic versus non-schematic imagery

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The manuscript is 17 pages long and includes 2 tables, 2 figures, and 2 appendices.

Abbreviations: BAT = Behavioural Avoidance Test; EPT = emotional processing theory; SUDs = Subjective Units of Distress; SC = skin conductance; SCRs = skin conductance responses; HRV = heart rate variability; LF/HF ratio = low frequency/high frequency ratio; FSQ = Fear of Spiders Questionnaire; SES = Self-Efficacy Scale; SI = exposure plus schematic imagery group; NSI = exposure plus non-schematic imagery group; EA = exposure alone group.

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Abstract

Research has provided controversial results regarding the role of distraction (vs. attentional focus) during exposure therapy. In the present study, we manipulated the nature of the concepts activated during exposure. Sixty-six spider phobics were exposed to pictures of spiders and asked, or not, to form mental images of concepts that were either related or unrelated to spiders. At pre-exposure, mid-exposure, post-exposure, and follow-up, subjective distress, heart rate variability, and skin conductance responses were measured and the Fear of Spiders Questionnaire and a Behavioural Avoidance Test were performed. Results showed that the activation of concepts unrelated to spiders led to return of distress at follow-up. Moreover, the activation of concepts related to spiders decreased emotional and avoidance responses between sessions. This pattern of results suggests that the nature of the activated concepts does not influence subjective distress during exposure, but plays an important role in the maintenance of distress reduction between sessions.

Keywords: Distraction, Attentional Focus, Exposure therapy, Spider phobia, Emotional processing, Self-efficacy

Introduction

The efficacy of exposure in the treatment of specific phobias is widely recognized among experts (Barlow, 2002). A recent meta-analysis has demonstrated that exposure-based treatments yield large effect sizes (Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008). The mechanisms underlying exposure therapy, however, still raise much debate (Craske et al., 2008; McNally, 2007), particularly concerning the role of attentional focus. A crucial question is whether partial distraction is beneficial or detrimental for therapeutic effectiveness: Not only is the answer important for the fundamental understanding of the processes involved, but it also implies opposite recommendations for clinical interventions.

Emotional processing theory (EPT; Foa & Kozak, 1986), based on the bioinformational model (Lang, 1977), poses that focusing attention on threat is necessary for therapeutic success, and it highlights emotional processing as a central mechanism. This theory is underpinned by the notion of fear structure, conceptualized as a memory network that includes information about (a) stimuli defining a feared situation, (b) responses in that situation, and (c) the meaning of these stimuli. According to EPT, emotional processing requires the activation of the fear structure. Distraction, i.e. paying attention to something not belonging to the fear structure, impedes emotional processing and therefore the reduction of anxiety. This view is compatible with other approaches such as the inhibitory learning theory (Bouton, 1993; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014), which requires awareness of the conditional stimulus, as well as awareness of the non-occurrence of the unconditional stimulus, and hence the focus of attention on these elements and the avoidance of distraction by other elements.

Other researchers have suggested that distraction may enhance the effects of exposure (Johnstone & Page, 2004; Oliver & Page, 2003, 2008). On the basis of the self-efficacy model

of Bandura (1988) and the model of Barlow (1988), these researchers argued that distraction allows individuals to stay in the feared situation and provides a coping technique that enhances self-efficacy and increases perceived emotional control, thereby reducing anxiety (Oliver & Page, 2003).

Studies investigating attentional focus in exposure therapy have mainly compared conditions in which attention was either focused on threat or partially distracted from it. However, the operationalization of distraction strongly varied across studies: Some manipulated the conversation with the therapist during exposure (neutral topics vs threat stimuli responses) (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999), others manipulated the cognitive load (Kamphuis & Telch, 2000; Raes, De Raedt, Verschuere, & De Houwer, 2009) or the activated concepts during exposure (Telch et al., 2004), and still others proposed a non-related task during exposure (e.g. play a puzzle; Schmid-Leuz, Elsesser, Lohrmann, Jöhren, & Sartory, 2007). The results of these studies are inconsistent, some favouring partial distraction (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999) and others suggesting the opposite (Grayson, Foa, & Steketee, 1982; Haw & Dickerson, 1998; Kamphuis & Telch, 2000; Mohlman & Zinbarg, 2000; Raes et al., 2009) or not showing significant differences between conditions (Antony, McCabe, Leeuw, Sano, & Swinson, 2001; Rose & Dudley McGlynn, 1997; Telch et al., 2004).

A recent meta-analysis systematically addressed the role of attention allocation in exposure therapy effectiveness (Podina, Koster, Philippot, Dethier, & David, 2013). Although no differences were demonstrated between distracted and focused exposure for distress and physiological measures, higher effectiveness regarding distress and behavioural avoidance was found at follow-up for distraction when it consisted of an interaction with the experimenter. Inconsistencies in earlier studies might partly result from the various ways that

distraction has been operationalized. A central issue for understanding potential effects of distraction is thus to target the main distinctive feature of EPT, i.e. whether the client focuses on matters that are associated with the fear structure (schematic concepts, "focused exposure") or not (non-schematic concepts, "distraction").

To date, only one study has directly manipulated the nature of the activated concepts during exposure (Telch et al., 2004): Claustrophobic patients were presented with words via a headphone and had to repeat the word aloud and to form a mental image. Some patients were presented with claustrophobia-relevant words (e.g., suffocate), while others were presented with neutral words (e.g., banana). No significant differences were found between these conditions. Unfortunately, whereas a return of distress is a crucial aspect in anxiety treatment (Craske & Rachman, 1987), no follow-up measure was proposed, greatly limiting the implications of this study.

The main aim of the present study was thus to determine whether the nature of the activated concepts (schematic vs non-schematic) impacts exposure effectiveness. A session of exposure and a follow-up assessment was proposed to spider phobics. Exposure was manipulated in three between-subjects conditions: exposure alone, exposure plus schematic imagery, and exposure plus non-schematic imagery. Multimodal measures of anxiety were performed before and after exposure, as well as at a 16-day follow-up session. As there is little evidence that within-session habituation is a good outcome indicator of global improvement (Craske et al., 2008), our exploration mainly focused on between-session habituation, and two hypotheses were tested. The hypothesis of maximal emotional processing (EPT) predicts that the activation of non-schematic words should lead to more return of distress at follow-up. Conversely, the hypothesis of distraction as a coping mechanism predicts that the activation of non-schematic words should not lead to return of distress. This study also aimed to investigate the processes of change at play in exposure

therapy concerning emotional processing. EPT predicts that the activation of non-schematic words should impede habituation during the first session, whereas the activation of schematic words should lead to a stronger habituation. Moreover, EPT predicts that within habituation is an index of successful learning that is related to between-session habituation.

Method

Participants

Participants were recruited through announcements on posters, in electronic mail, and on social networks. The volunteers scoring over 4 (of 7) on the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) were invited to participate in the study. All participants (n = 66) completed the A, B, C, D, F, and G criteria of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; American Psychiatric Association, 2000), as ascertained by the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (First, Spitzer, Gibbon, & Williams, 2002). The sample consisted of 64 women and 4 men. All of the participants were Caucasian. Their age ranged between 18 and 54 years (M = 26.97, SD = 7.99). Five participants were medicated with antidepressants, but none of the participants were medicated with benzodiazepines or neuroleptics. All participants gave their informed written consent before starting the survey. The study protocol was approved by the ethical committee of the Psychology Department of the Université catholique de Louvain.

Measures

Self-reported measures

The FSQ (French validation: Delroisse & Philippot, 2007) comprises 18 items (7-point Likert-type scale) and measures two factors: emotional and avoidance responses, and anxious anticipation of spiders.

A Self-Efficacy Scale (SES) was created following the recommendations of Bandura (2006). It consists of 17 items, each depicting a step of the Behavioural Avoidance Test (BAT), for which participants report their confidence in their capacity to perform it, on a scale from 0 (cannot do at all) to 100 (highly certain can do).

The Subjective Units of Distress (SUDs) Scale (Wolpe, 1958) measured the peak level of distress when viewing spider pictures from the assessment set (see Materials section) on a scale from 0 (no distress) to 100 (extreme distress).

Behavioural measure

The BAT measured the number of steps that participants could achieve when confronted with a live spider. It consisted of a 17-step hierarchic exposure described by Merluzzi, Taylor, Boltwood, and Gotestam (1991), starting with standing at 3 m from a spider enclosed in a container to letting the spider walk on one's forearm. The participants were asked to perform each of the steps. They could stop as soon as they wanted to.

Physiological measures

Skin conductance (SC) and heart rate variability (HRV) were measured via the Active Two System (Biosemi, Amsterdam, Netherlands) in response to the assessment set of spider pictures (see Materials section). For SC, electrodes were placed on the forefinger and middle finger. HRV was measured by a digital photoplethysmograph. In order to reduce noise, participants were explicitly asked not to move during measurement.

Materials

Pictures of spiders inducing high arousal were selected from the Geneva Affective Picture Database (Dan-Glauser & Scherer, 2011). Fifty pictures were used for exposure (exposure set). Seven novel sets of six spider pictures with similar mean arousal scores, $F(6,$

35) = .001, *ns*, but with pictures that differed from the exposure pictures (assessment sets), were used to assess the SUDs and the physiological variables, as suggested by Craske et al. (2008). This also allowed testing the generalizability of the results. A live spider was used for the BAT. This spider was 5-cm long (Agelenidae).

The word stimuli were selected in a pretest. Participants with arachnophobia and psychotherapists who had treated arachnophobia were asked to produce a large number of words associated with fear of spiders. These words were then matched to control words with a similar frequency, based on the lexical database of New, Pallier, Brysbaert, and Ferrand (2004). Finally, the two sets of 50 words each were evaluated on their degree of imageability (as measured by Desrochers & Thompson, 2009) and inclusion in the fear schema (the degree to which the word evokes the spider or the fear associated with it on a 7-point scale) by 30 participants with arachnophobia who scored 4.5 or higher on the FSQ. The 24 words displaying the highest degree of inclusion in the fear schema were included in the schematic set, and the 24 words displaying the lowest level of inclusion were included in the non-schematic set. They differed significantly in terms of degree of inclusion in the fear schema, $t(23) = 27.841$, $p < .001$, but showed no significant differences for imageability, $t(42) = .118$, *ns*, and frequency, $t(46) = .178$, *ns*.

General Procedure

The study comprised two sessions. In the first session, participants performed measures before exposure, at mid-exposure, and after four trials of prolonged exposure with spider pictures from the exposure set. The second session tested the maintenance of Session 1 distress reduction. Another trial of exposure was provided and the measures were performed again. An overview of the procedure is provided in Figure 1.

---Insert Figure 1 about here ---

At the first session, participants successively completed the FSQ, SES, the first BAT, and four 5-min exposure trials with spider pictures. Each exposure trial consisted of an exposure to pictures of spiders from the exposure set. Participants were randomly allocated to one of the three conditions: exposure plus schematic imagery (SI), exposure plus non-schematic imagery (NSI), or exposure alone (EA). Participants in SI and NSI performed a dual task during the exposure. The first task consisted of focusing on spider pictures displayed on the screen at positions varying randomly every 1 to 5 s and pressing the space bar at every change in the spider picture or position. The concurrent task was to form a mental image of a word presented every 12.5 s via headphones and to verbally report the intensity of imagery on a scale from 0 to 10. Before starting, a short training consisting of the same dual task but with geometrical figures and neutral words was performed. Although the dual task was similar across conditions, the nature of the words to imagine varied: schematic (spider, net, etc.) in the SI condition and non-schematic (steel, pen, etc.) in the NSI condition. In the EA condition, participants performed only the first task and did not imagine words.

Before exposure, at mid-exposure, and after each exposure trial, SC, HRV, and SUDs were measured in response to a novel “assessment” set of six spider pictures, each presented for 7 s and separated by a 4-s blank screen. After the four exposure trials, participants again completed the FSQ, SES, and BAT. Note that the BAT and the exposure trials were conducted in a different context. The BAT was performed with a live spider, whereas the exposure trials were conducted with pictures of spiders in a different room.

At the second session, participants completed all the measures before and after a single exposure trial. The mean number of days between the sessions was 16.17 (*SD* = 4.45). At the end of the experiment, participants were fully debriefed about the objective of the study and referred to a therapist if they were willing to engage in therapy.

Results

Data Preparation

Skin Conductance (SC)

SC was analysed with Ledalab (Benedek & Kaernbach, 2010). Continuous decomposition analysis was performed to distinguish phasic and tonic activity. A response window of 1 to 4 s after stimulus onset and a minimum amplitude criterion of .01 µS were used (Boucsein et al., 2012). Skin conductance responses (SCRs) were square root transformed and averaged.

Heart Rate Variability (HRV)

Pulse peaks were detected by using a peak detection algorithm from Friesen et al. (1990) and applied in MATLAB 8.0 (Mathworks, Natik, MA, USA). HRV spectral indexes calculated with this algorithm on a photoplethysmograph signal at rest have been shown to correlate strongly with indexes derived from an electrocardiogram (Giardino, Lehrer, & Edelberg, 2002). Signals that were not suitable for peak detection were excluded (4.91% of data). Each signal was visually inspected for false detection. Interbeat intervals were analysed with ArtiiFact (Kaufmann, Sütterlin, Schulz, & Vögele, 2011) at a frequency of 128 Hz. Artefacts were corrected with a linear convolution. Fast Fourier transform was applied. For each participant, a low frequency/high frequency (LF/HF) ratio was calculated and log transformed to correct for skewness of the distribution. As LF reflects sympathetic activity and HF reflects parasympathetic activity, this ratio is an index of the sympathovagal balance (Bernston et al., 1997).

Statistics

Statistical analyses were performed with SPSS 21 (IBM, Armonk, NY, USA). Within- and between-sessions effects were tested separately. Greenhouse-Geisser correction was

applied when sphericity was not met. The mean and standard deviation of each dependent measure are presented in the appendices.

Preliminary analyses

Dropouts

Seven participants did not complete the second session (three in the SI group, two in the NSI group, and two in the EA group, with no difference among conditions, $\chi^2 = .320$, *ns*). Dropouts were compared with finishers on outcome and on demographic variables. There were no differences, except that dropouts reported significantly less self-efficacy, $t(64) = 2.206$, $p < .05$, and less achievement at the BAT, $t(64) = 2.796$, $p < .01$.

Group equivalence

Preliminary analysis indicated no pre-treatment differences among the groups on each of the outcome variables, i.e., on emotional and avoidance responses, $F(2, 63) = .857$, *ns*; anxious anticipation of spiders, $F(2, 63) = .959$, *ns*; SUDs, $F(2, 63) = 1.519$, *ns*; SCRs, $F(2, 63) = 1.663$, *ns*; LF/HF ratio, $F(2, 63) = .426$, *ns*; and BAT $F(2, 63) = .332$, *ns*. All groups were similar in terms of age, $F(2, 63) = .936$, *ns*; gender ($\chi^2 = 3.726$, *ns*); antidepressant medication ($\chi^2 = 1.731$, *ns*); and number of days between the sessions, $F(2, 56) = 1.152$, *ns*.

Return of distress across conditions

Repeated measure analyses of covariance with Time as within-subject factor (Post-exposure, Follow-up) and Condition as between-subjects factor were computed for each outcome variable to evaluate the return of distress across conditions. Pre-exposure measure was introduced as a covariate for each analysis. The results are presented in Table 1.

---Insert Table 1 about here ---

For the emotional and avoidance scale of the FSQ, a significant Time × Condition interaction was found. Post hoc pairwise comparisons are presented in Figure 2. These analyses indicated that in the SI group, participants showed a significant decrease between post-exposure and follow-up (Cohen's d = .47), whereas no significant change was observed in the NSI group or in the EA group. Moreover, the participants in the SI group reported a marginally significant lower score at follow-up than did the participants in the NSI group (Cohen's d = .29), whereas other differences between conditions, both at post-exposure and at follow-up, were not significant. For the other dimension of the FSQ (anxious anticipation), no significant main effect of Time or Time × Condition interaction was observed.

---Insert Figure 2 about here ---

For the SUDs, a significant main effect of Time and a marginally significant Time × Condition interaction effect were shown. Post hoc pairwise comparisons showed that participants in the NSI group displayed a significant return of distress (Cohen's d = .39), whereas no change was observed in the SI group or in the EA group. Moreover, at follow-up, the participants in the NSI group displayed a significantly higher score than did the participants in the SI group (Cohen's d = .32). The other differences between conditions, both at post-exposure and at follow-up, were not significant. No main effect of Time was observed, but a significant Time × Condition interaction effect was shown for SCRs. Post hoc pairwise comparisons indicated that participants in the EA group displayed a significant return of distress between post-exposure and follow-up (p < .01, Cohen's d = .45). Moreover, at post-exposure, the participants in the NSI group had significantly higher scores than did participants in the EA group (p < .01, Cohen's d = .42), and marginally significantly higher scores than did participants in the SI group (p = .073, Cohen's d = .29). For the LF/HF ratio, no significant main effect of Time or Time × Condition interaction effect were shown. For BAT, no Time × Condition interaction effect was demonstrated, but a main effect of Time

was observed. Participants improved their scores between post-exposure and follow-up in all conditions.

Process analyses

To investigate the processes of change, we addressed additional questions.

- Did the manipulation induce different response patterns on the outcome variables during the first session?

Repeated measure analyses of variance[1] with Time (Pre-exposure, Mid-exposures, Post-exposure) as within-subject factor and Condition as between-subjects factor were computed for each outcome variable (see Table 2).

---Insert Table 2 about here---

No significant effects of Condition or Time × Condition effects were shown for FSQ facets, SUDs, or BAT. For SCRs, a significant main effect of Time was modulated by a Time × Condition marginal interaction. Post hoc pairwise comparisons indicated that in the SI and EA groups, participants displayed a significant decrease from pre-exposure to post-exposure ($p < .001$ and, $p < .05$, respectively). In contrast, participants in the NSI group displayed no significant decrease, *ns*.

In regard to the LF/HF ratio, analyses revealed a marginal effect of Condition, $F(2, 59) = 2.995$, $p = .058$, $\eta^2 = .092$. Post hoc comparisons indicated that participants in the SI group displayed a higher LF/HF ratio than did participants in the NSI group ($p = .054$, Cohen's $d = .38$). To better understand this effect and because there was no significant difference among conditions at pre-exposure regarding the LF/HF ratio, we reran the analyses without pre-exposure time. These new analyses revealed a significant effect of Condition, $F(2, 59) =$

[1] The same results were obtained with multilevel analyses.

3.923, $p < .05$, $\eta^2 = .117$. Post hoc tests indicated that participants in the SI group displayed a higher LF/HF ratio than did participants in the NSI group ($p = .021$, Cohen's $d = .43$).

- Are between-session effects related to within-session effects?

Correlations between the within- and between-session changes were computed for each variable. In the NSI group, the more emotional and avoidance responses decreased during the first session, the more they increased between sessions ($r = .515$, $p < .05$). This correlation was not significant in the SI group ($r = -.061$, *ns*) or in the EA group ($r = -.100$, *ns*). Regarding the SUDs, the more they decreased during the first session, the more important was the return of distress between the sessions in the NSI group ($r = .663$, $p < .01$) and in the EA group ($r = .513$, $p < .01$), but not in the SI group ($r = .147$, *ns*).

Correlational analyses showed no significant link between the between-sessions effects and the physiological or self-efficacy changes in the first session ($r < .201$, *ns*).

Discussion

This study aimed to trial two opposing views regarding the role of attentional focus during exposure therapy. A computerized dual task with spider phobics was used to manipulate the nature of the concepts activated during visual exposure. Results show that the nature of these concepts does not modulate subjective distress reduction within the first session, during which all groups displayed similar decreases, but that it plays an important role in the later maintenance of distress reduction. In contrast to the activation of schematic concepts, the activation of non-schematic concepts in imagery during exposure was associated with a return of subjective distress at follow-up. This return of distress was positively related to the reduction of distress during the first session, which suggests that distraction may be effective in reducing anxiety at that moment only. Moreover, the activation of schematic concepts induced a significant decrease of emotional and avoidance responses between

sessions that was not related to the importance of decrease during the first session. These effects were especially marked in terms of trajectories within each group, though the differences among groups at follow-up, while corresponding to the expected pattern, were not as significant. The differential between-sessions effects are linked with differentiated physiological activation patterns within the first session. Indeed, in contrast with the activation of non-schematic concepts, the activation of schematic concepts during exposure led to a significant reduction of SCRs during the first session. Furthermore, it tended to induce a higher sympathovagal balance.

These results extend to follow-up, the fear-reduction previously shown favouring attentional focusing (Grayson et al., 1982; Haw & Dickerson, 1998; Kamphuis & Telch, 2000; Mohlman & Zinbarg, 2000; Raes et al., 2009). They are consistent with the predictions of the bioinformational model of Lang (1977) and the EPT (Foa & Kozak, 1986): The activation of concepts that do not belong to the fear structure induced decreased physiological reactivity, as reflected in sympathovagal balance and a return of subjective distress at follow-up. The absence of correlation between the changes in self-efficacy, on the one hand, and the between-session effects on either distress or avoidance responses, on the other hand, goes against the notion that the effect is accounted for by an expectation or a placebo effect. Had that been the case, all of these self-reported measures would have covaried. Rather, it suggests involvement of automatic and implicit changes of the emotional representation. Overall, these results suggest that the nature of the activated concepts during exposure induces distinct mechanisms: an effective coping in reducing distress in the short term at a definite time for non-schematic concept activation, and longer term learning (e.g., emotional processing, inhibitory learning) for schematic concept activation.

Conversely, our results conflict with those from studies that demonstrated a superiority of distracted exposure (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page,

1999), which might be partly explained by the fact that those studies induced distraction through interactivity with the therapist. This variable has been identified in the meta-analysis of Podina et al. (2013) as a moderator of the effect of distraction on behaviour and distress. In fact, no studies showed a consistent positive effect of distraction without interactivity, suggesting that interactivity with the therapist is the active factor, rather than distraction per se. Indeed, positive interactions with the therapist might induce changes in the subjective evaluation of distress and in achievement because of efforts of the client to meet the expectancies of the therapist.

Although self-efficacy changes were not related to the observed effect, self-efficacy seems to play a role in adherence to treatment. Indeed, participants with low self-efficacy were at higher risk of dropping out. These results suggest that therapists should be particularly careful in identifying participants with low self-efficacy in order to prevent dropout. An approach based on guided mastery (Bandura, 1997), which mainly consists of providing the individual with environmental conditions that ensure successful experiences, may be particularly indicated for these participants.

No differences among conditions in regard to the BAT were observed. This result reflects the often-observed discordance among the response systems (behavioural, subjective, and physiological responses) of emotions (Barlow, 1988).

Although differences in visual processing might be involved in the group differences observed (e.g. more specific processing of the visual features in the schematic condition), the central strength of this study is the direct manipulation of the nature of the concepts activated during exposure therapy and the measure of extensive indicators at several times. This procedure allowed strong experimental control over the many variables that could influence the course of anxiety and a comprehensive measurement of the discordant facets of emotions

over time. Nonetheless, this study has several limitations. As some effects are marginal, it could be argued that the number of participants was too small. Moreover, we measured the SUDs in response to the assessment sets of spider pictures but not during exposure trials where concepts were activated. This allowed quantifying the generalization of distress decrease, but not the changes in distress induced by the differential activation of concepts per se. Finally, as it could be considered an exposure itself, the many repetitions of the BAT may hamper its stability across time and dilute the effect of the experimental manipulation.

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Fig. 1. Procedure and measurements. FSQ = Fear of Spiders Questionnaire; SUDs = Subjective Units of Distress; HRV = heart rate variability; SC = skin conductance; SES = Self-efficacy Scale; BAT = Behavioral Avoidance Test; ME = mid-exposure time.

Fig. 2. Post hoc comparisons (estimated marginal means). (a) Emotional and avoidance responses (Fear of Spiders Questionnaire; FSQ) as a function of time and treatment condition. (b) Subjective Units of Distress as a function of time and treatment condition. (c) Averaged and square root transformed skin conductance responses (SCRs) as a function of time and treatment condition. * $p < .05$; ** $p < .01$. All other relations are non-significant (>.10).

Table 1. Between-sessions effects: Repeated measure ANOVAs.

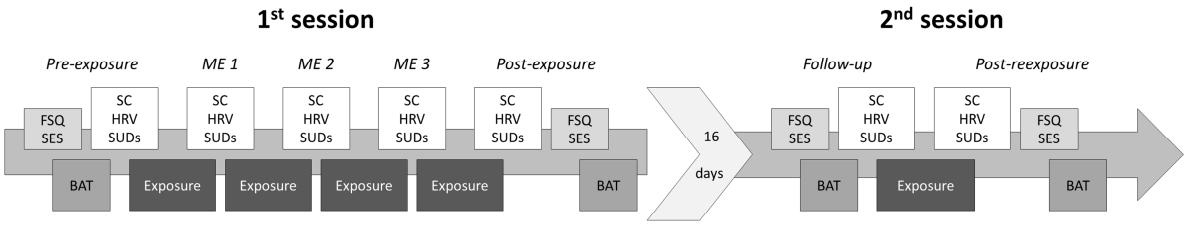
Variable	Time effect					Time × condition effect					Condition effect				
	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2
FSQ															
Emotional and avoidance responses	1	55	2.435	ns		2	55	3.276	.045	.106	2	55	.908	ns	
Anxious anticipation of spiders	1	55	.684	ns		2	55	.420	ns		2	55	.421	ns	
SUDs	1	55	.020	ns		2	55	2.873	.065	.095	2	55	.828	ns	
SCRs	1	55	.236	ns		2	55	3.288	.045	.107	2	55	1.315	ns	
HRV: LF/HF ratio	1	52	.847	ns		2	52	1.685	ns		2	52	1.446	ns	
BAT	1	55	4.604	.036	.077	2	55	.202	ns		2	55	.731	ns	

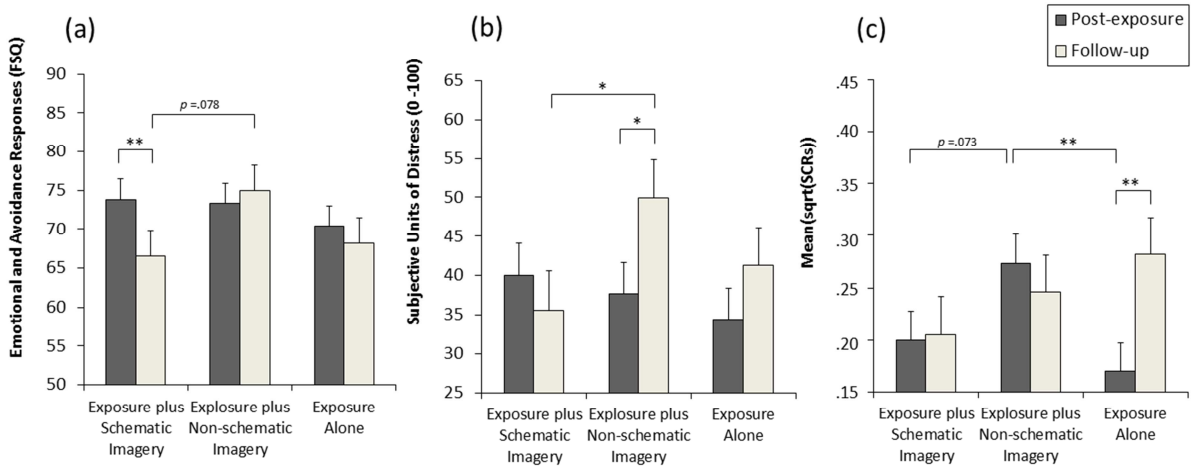
Note. ANOVAs = analyses of variance; FSQ = Fear of Spiders Questionnaire; SUDs = Subjective Units of Distress; SCRs = skin conductance responses (square root transformed); HRV = heart rate variability; LF/HF ratio = low frequency/high frequency ratio (logarithmic transformation); BAT = Behavioral Avoidance Test; ns = >.10.

Table 2. Within-session effects: Repeated measure ANOVAs.

Variable	Time effect					Time × condition effect					Condition effect				
	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2
FSQ															
Emotional and avoidance responses	1	63	61.616	<.001	.494	2	63	1.201	ns		2	63	.265	ns	
Anxious anticipation of spiders	1	63	.147	ns		2	63	.824	ns		2	63	1.144	ns	
SUDs	3	174	12.421	<.001	.165	6	174	.834	ns		2	63	.917	ns	
SCRs	4	252	15.854	<.001	.474	8	252	1.906	.059	.057	2	63	.366	ns	
HRV: LF/HF ratio	4	236	.322	ns		8	236	.621	ns		2	59	2.995	.058	.092
BAT	1	63	83.875	<.001	.571	2	63	.045	ns		2	63	.306	ns	

Note. ANOVAs = analyses of variance; FSQ = Fear of Spiders Questionnaire; SUDs = Subjective Units of Distress; SCRs = skin conductance responses (square root transformed); HRV = heart rate variability; LF/HF ratio = low frequency/high frequency ratio (logarithmic transformation); BAT = Behavioral Avoidance Test; ns = <.10.





Highlights

- We manipulated the nature of the concepts activated during exposure therapy.
- Concepts unlinked to spiders led to a return of distress at follow-up.
- Concepts linked to spiders led to decreased emotional responses between sessions.
- Activated concepts may have a major role in the maintenance of distress reduction.

Appendix A. Mean (*M*) and standard deviation (*SD*) for each time measure in the first session across conditions.

Variable	Schematic imagery (n=22)					Non-schematic imagery (n=22)					Exposure alone (n=22)				
	Pre-exposure	ME 1	ME 2	ME 3	Post-exposure	Pre-exposure	ME 1	ME 2	ME 3	Post-exposure	Pre-exposure	ME 1	ME 2	ME 3	Post-exposure
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
FSQ															
Emotional and avoidance responses	83.86 (10.30)	-	-	-	75.27 (14.70)	82.59 (8.38)	-	-	-	72.14 (12.84)	86.23 (9.26)	-	-	-	72.41 (16.56)
Anxious anticipation of spiders	17.73 (4.75)	-	-	-	18.14 (5.65)	15.77 (5.44)	-	-	-	15.73 (5.52)	17.14 (4.12)	-	-	-	16.32 (4.65)
SUDs	55.45 (21.04)	49.77 (22.17)	46.14 (23.60)	49.55 (25.77)	44.09 (22.61)	44.32 (22.85)	41.82 (25.71)	41.14 (25.72)	39.68 (27.87)	34.86 (21.13)	53.64 (24.21)	46.59 (20.55)	41.86 (21.05)	41.41 (22.24)	36.18 (21.99)
SCRs	.404 (.210)	.218 (.121)	.240 (.151)	.253 (152)	.230 (.155)	.315 (.141)	.257 (.167)	.258 (.122)	.283 (.121)	.258 (.132)	.347 (.128)	.247 (.142)	.231 (.170)	.219 (.200)	.178 (.121)
HRV: LF/HF ratio[#]	.110 (.386)	.281 (.475)	.203 (.548)	.217 (.465)	.223 (.484)	.036 (.499)	-.079 (.642)	-.098 (385)	-.100 (.406)	-.076 (393)	.168 (.482)	-.098 (.385)	.084 (.533)	.057 (.439)	.041 (.544)
BAT	6.59 (3.98)	-	-	-	8.36 (4.08)	7.50 (3.33)	-	-	-	9.14 (3.33)	7.09 (3.78)	-	-	-	8.82 (3.33)

Note. [#]For this variable, the number of participants in each group used to calculate the statistics were as follows: $n_{\text{schematic imagery}} = 21$; $n_{\text{non-schematic imagery}} = 21$; $n_{\text{exposure alone}} = 20$. FSQ = Fear of Spiders Questionnaire; SUDs = Subjective Units of Distress; SCRs = skin conductance responses (square root transformed); HRV = heart rate variability; LF/HF ratio = low frequency/ high frequency ratio (logarithmic transformation); BAT = Behavioral Avoidance Test.

Appendix B. Mean (*M*) and standard deviation (*SD*) for time measures between sessions across conditions.

Variable	Schematic imagery (n=19)		Non-schematic imagery (n=19)		Exposure alone (n=20)	
	Post-exposure	Follow-up	Post-exposure	Follow-up	Post-exposure	Follow-up
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
FSQ						
Emotional and avoidance responses	73.58 (14.44)	66.21 (20.12)	70.90 (12.82)	72.05 (13.19)	72.95 (17.23)	71.30 (22.01)
Anxious anticipation of spiders	17.32 (5.54)	15.16 (4.88)	16.10 (5.63)	15.50 (5.82)	16.50 (4.83)	15.00 (6.87)
SUDs	42.37 (22.32)	38.42 (24.16)	33.85 (20.39)	45.25 (25.98)	36.05 (22.41)	43.25 (26.22)
SCRs	.214 (.155)	.226 (.142)	.262 (.134)	.230 (.182)	.167 (.109)	.279 (.200)
HRV: LF/HF ratio[#]	.198 (.496)	.016 (.577)	-.073 (.414)	-.207 (.441)	.019 (.549)	.117 (.429)
BAT	9.53 (2.99)	9.84 (3.20)	9.10 (3.49)	9.60 (2.80)	8.90 (3.48)	9.05 (3.62)

Note. Pre-exposure measure was used as a covariate. [#]For this variable, the number of participants in each group used to calculate the statistics were as follows: $n_{schematic\ imagery} = 18$; $n_{non\text{-}schematic\ imagery} = 19$; $n_{exposure\ alone} = 19$. FSQ = Fear of Spiders Questionnaire; SUDs = Subjective Units of Distress; SCRs = skin conductance responses (square root transformed); HRV = heart rate variability; LF/HF ratio = low frequency/ high frequency ratio (logarithmic transformation); BAT = Behavioral Avoidance Test.